magnet --. A comma has been inserted after "Thus" at line 9 (13 above). Paragraph 0008 has been amended to add "and keeping it" to clarify the sentence. Paragraph 0021, line 2 had been amended to change "preferably" to "may be." The sentence, "In either arrangement, the method for attachment should permit the flange shield to perform its function of capturing stray magnetic fields from the magnet," has been added at line 3 to caution the skilled artisan that the attachment mechanism should not interfere with the functioning of the flange shield. Applicants submit that this cautionary note is obvious to one of ordinary skill.

It his action dated September 11, 2002, the Examiner objected to the abstract. A rewritten abstract is entered by the above amendment.

In the same action, the Examiner entered a § 112, second paragraph rejection of claim 7 because the term "the housing" had no antecedent basis. Claim 7 has been amended to instead recite the term "base frame" which does appear in claim 1. A disk drive's housing includes a base frame.

Similar amendments have been made to claims 5 and 13.

Claims 6 and 14 have been amended to change "axial" to -- radial --.

§ 103(a) Rejections of claims

Examiner entered § 103(a) rejections of claims 1-5, and 7-13 over Takemura et al. (U.S. patent number 5,880,545) in view of Kennedy et al. (U.S. patent number 6,055,126). Takemura et al. was cited to show the invention substantially as claimed except for the following:

1. the "flux shield" extending the entire width of the magnet;

2. the "flux shield" being formed of the magnetic material;
3. the "shield" being comprised of steel or mu metal; or
4. the "shield" being integrated on the "back iron" or glued to axial end of the magnet.

Kennedy et al. was cited to show

1. a "shield" (90) extending substantially of the entire width of the magnet and intervening between the magnet and the base;
2. the "shield" being formed of magnetic material, referencing column to 3, lines 36-37;
3. the "shield" being comprised of steel;
4. the "shield" being integrated with the back iron;

Referring first to Takemura et al., applicants take the position that Takemura et al. does not show "a flux shield" at all, let alone a "flux shield" that lacks only the details of the above described list. In order to be a "flux shield," the shield has to be of a magnetic material in order to block the transmission of magnetic flux therethrough. Because the Examiner agrees that Takemura et al. does not show that structure 17 is magnetic, it follows that structure 17 is not a "flux shield."

What Takemura et al. does show is a fluid sealing or fluid leakage prevention device 17 that may be "plastic," column 4, line 3, column 7, line 47; "absorbent," column 5, line 38, column 7, line 60, and column 9, line 49; or "polyester," column 8, line 23. All of these are non-magnetic.

Kennedy et al. shows a manufacturing assembly damage-protection "shield" that is preferably aluminum, column 2, line

67, column 4, line 18 and column 4, line 54; and may be "stainless steel, plated metal, [or] plastic," column 3, lines 36-37. Aluminum, stainless steel and plastic are all non-magnetic and therefore cannot be "flux shields." "Plated metal" can be either magnetic or non-magnetic depending on the choice of metals. "Plated metal," however is not defined elsewhere in the patent. Applicant submits that given that there is a deliberate choice of non-magnetic materials (aluminum, stainless steel or plastic) as the other alternatives, one of ordinary skill would understand that the "plated metal" referred to in Kennedy et al. would have to be a non-magnetic "plated metal."

The purpose for the Kennedy "shield" is to prevent mechanical damage of the magnet during assembly of the spindle motor and disk drive. Kennedy et al. contains no suggestion that its "shield" has any function whatsoever as a "flux shield" that is intended to shield motor magnet stray magnetic flux from the base frame of the magnetic disk drive. In fact, the Kennedy et al. disclosure illustrates conventional disk drive art thinking where the base frame itself forms part of the flux shield by being a magnetic metal such as steel. But, as applicants have disclosed herein, using the base frame as a "flux shield" induces power-consuming drag on the motor.

Applicants respect submit that the shields of neither Takemura et al. nor Kennedy et al. are "flux shields" as called for by independent claims 1 and 9, or "means formed of a magnetic material to capture any stray magnetic flux from the motor magnet" as called for by independent claim 8.

For the above reasons, applicants respectfully traverse the § 103(a) rejection of claims 1-7, and 7-13.

The Examiner rejected claims 6 and 14-15 over Takemura, et al. in view of Kennedy et al. as applied to claims 1 and 12, and

further view of Sakai (J.P. 404103076). The Examiner states that Sakai discloses a shield (7) that extends the entire width of the magnet (6) but is limited to extending the axial width of the magnet. Sakai shield 7 extends the axial length of the Sakai magnet. However, if it was a "flux shield" within the meaning of the current claims, it would prevent cooperative interaction of the magnetic flux from the stator with the magnetic flux from the magnet, which is the whole point of a motor. For this reason, Sakai shield 7 cannot be a "flux shield" as claimed.

Applicants respectfully traverse.

Regardless, claims 6 and 14 have been amended to recite "radial" rather than "axial."

Applicant respectfully submits the claims are in a condition for allowance.

Respectfully submitted,

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Claims showing amendments.

5. (Amended) A motor as claimed in claim 1 wherein the shield is glued to the axial end of the magnet facing the ~~housing~~ base frame.

6. (Amended) A ~~shield~~ motor as claimed in claim 1 wherein the shield extends the entire width of the magnet but is limited to extending the ~~axial~~ radial width of the magnet.

7. (Amended) A motor as claimed in claim 1 therein the ~~housing~~ base frame defines a well, the magnet and back iron extending axially from a lower surface of the rotor and being axially below the discs so that the stator and magnet and back iron of the motor are all axially located below the hub and the discs supported by the hub.

13. (Amended) A motor as claimed in claim 9 wherein the shield is glued to the axial end of the magnet facing the ~~housing~~ base frame.

14. (Amended) A ~~shield~~ motor as claimed in claim 12 wherein the shield extends the entire width of the magnet but is limited to extending the ~~axial~~ radial width of the magnet.

Specification showing amendments:

[0005] Currently, disk drive spindle motors are being operated at increasingly higher speeds in order to speed up access times and increase storage capacities. In current spindle motor design, the problem arises from the fact that the magnet~~ic~~, as described above, has a plurality of poles. The inventors have recognized that when a magnet with a plurality of poles is moving at high speed near a piece of metal, then the stray flux emitted by the magnet may interact with that metal and create a drag on the rotating magnet. The faster the speed of the rotation of the magnet past the metal, (such as is found in the flange or base of the housing of a disc drive), the more drag is created. This can create a serious power loss in the disc drive system. Thus, the problem presented is to prevent undue distribution of stray magnetic flux and reduce the undesirable power losses. At higher speeds the system power increases due to windage loading, bearing losses, magnetic coupling, etc. It is highly desirable that power dissipation be prevented from increasing as drive performance is incremented. With this requirement, this patent seeks to reduce system losses due to magnetic fringing from the spindle motor magnet. Two components of magnet losses are being addressed here, one is Magnetic Hysteresis and is directly related to magnetic angular velocity. Power hyst = d phi d T and is = 2 * pi *RPM/60 *number of magnetic poles.

[0008] The main objective of the invention is to provide means for capturing stray magnetic flux and keeping it from interacting with surrounding metal of the motor frame, in

order to prevent unnecessary drag being imposed on the rotation of the magnet and hub.

[0021] As noted above, the flange shield may extend either partly or entirely across the axial end of the magnet, and may be ~~preferably is~~ fastened directly to the axial end of the magnet although it may be spaced there from. In either arrangement, the method for attachment should permit the flange shield to perform its function of capturing stray magnetic fields from the magnet. It should be formed of the same or similar metal to that used in the back iron, typically steel or mu metal.

ABSTRACT OF THE DISCLOSURE

~~A motor comprises a shaft supported from a base frame and supporting a hub and one or more on the outer diameter thereof. A stator is supported from the shaft, and comprises a plurality of laminations supporting coils which are sequentially energized to cause rotation of a hub which overlies the stator and supports a magnet and back iron radially adjacent these stator coils.~~ A magnetic flux shield ~~is provided~~ extending substantially the entire width of a magnetic disk drive spindle motor ~~the~~ magnet ~~and intervening~~ is mounted between the magnet and the disk drive's base frame and ~~rotating~~ rotates with the magnet. The flux shield is formed of a magnetic material to capture any stray magnetic flux from the motor magnet that may produce power draining eddy currents in the base frame.